TEXTILE RESEARCH

Publication of

United States Institute for Textile Research, Inc.

CHARLES H. CLARK, *Managing Editor,*

Publication Office: Prince and Lemon Sts., Lancaster, Pa.

Editorial and General Offices: 65 Franklin St., Boston, Mass.

Board of Editors

DR. W. E. EMLEY

PROF. L. A. OLNEY

PROF. E. R. SCHWARZ, *Chairman*

Publication Committee

WILLIAM W. BUFFUM

ERNEST N. HOOD

CHARLES H. CLARK, *Chairman*

Vol. VI **March, 1936** **No. 5**

CONTENTS

British and American Research Policies 230

What's Next in Science? Dr. Karl T. Compton 231

The Degradation of Silk, Wild Silk and Wool by Steam. Eunice Chamberlin Walde, Mildred Barr and Rachel Edgar 235

British Textile Research During 1934–35 241

Special Course in Research 244

Abstracts 246

Textile Foundation's Educational Program 260

Entered as second-class matter, November 17, 1932, at the Post Office at Lancaster, Pa., under the Act of Congress of March 3, 1879.

Issued monthly at Prince and Lemon Streets, Lancaster, Pa., for United States Institute for Textile Research, Inc., Boston, Mass..

Made in United States of America.

Subscription price $5.00 a year. Single copies .50.

The Editor's Page

British and American Research Policies

THE reports of the British textile industry research associations for the fiscal year 1934–35, reviewed in part in this issue, indicate that the cotton and rayon organization (Shirley Institute) has made more substantial progress than the wool, silk and linen associations, at least in winning increased financial co-operation of manufacturers, which also qualified it to receive a proportionally increased grant from the government.

It will be noted that a large part of Shirley's new money was to be invested in buildings and machinery to be used for experimental work, which in turn calls for increased annual expenditure for labor, upkeep, etc. This freezing of a considerable part of their available funds in capital assets has been a feature of British textile research policy that differentiates it in a vital manner from the policy of domestic research organizations, none of whose funds are thus expended.

Since the research association for the British cotton industry was organized in 1919, that for the wool industry in 1918, for the linen industry in 1919 and the silk industry in 1921, these associations have received grants from the government's so-called "million-pound fund" approximating $1,750,000. The Shirley Institute (cotton and rayon) alone had received to July, 1934, grants of £166,122. One of the first uses of this government fund was for laboratory buildings and equipment.

Existence of research plants and of the staffs of scientists and technicians to operate them have not only encouraged the plant staffs to assume full responsibility for the industry's research, but have caused the industries to expect them to initiate it and produce results. It seems to have discouraged co-operative effort among manufacturers, and to a certain extent independent research by scientists of the universities and technical schools. Fortunately, the latter effect was only temporary, or during the period when the industry's research plants were concentrating upon fundamental work. Since the basic program was curtailed to make way for applied research the outside research workers have been encouraged to increase their contributions of basic research.

(*Continued to P. 245*)

What's Next In Science?

By DR. KARL T. COMPTON *

IT is an all too common practice of scientific publicists and prognosticators to give free vent to their imaginations in a most unscientific way by picturing our descendants as flying through interplanetary space, after the manner of Buck Rogers—or operating a navy with a thimbleful of transmuting atoms—or banishing old age by administration of glandular extracts. No doubt many of the past triumphs of science were, relatively to the times, as spectacular and even more unexpected than these would be. However, scientific progress is not a great leap of imagination, but a steady process, like the advance of a great army; at times strategic positions are captured, as when the positive electron (positron) was discovered; at times there is a steady "mopping up" process all along the line, as when the systematic search for chemical isotopes followed the first discovery; at times there is a retreat, as when a theory is proved untenable; at times a new powerful engine of this scientific war is invented, like the radio tube amplifier. While the scientific campaign is generally well planned in advance and directed toward certain main objectives, it is also, on occasion, opportunistic in that its center of activity may be quickly shifted by some new discovery or idea which discloses new territories to be conquered.

A better analogy to scientific progress is geographical exploration. Just as the discovery of the Great Lakes and the Ohio, Mississippi and Missouri Rivers led to their use as avenues of colonization, so great scientific discoveries and theories are the channels for widespread advance of scientific knowledge. Similarly there are desert and mountain barriers in science where progress is slow because the oases and passes have not yet been discovered. But, as far as we can now see, there is no limit to the completeness with which man may expect to understand the materials, forces and processes of nature.

This week the armies of science have gathered in St. Louis to report their conquests during the past year and to plan their future campaigns. There are many divisions to this army—the mathematicians, engineers astronomers, chemists, physicists, botanists, psychologists, medical men, biologists, sociologists and many others—152 national scientific societies all included in the American Association for the Advancement of Science. Some one has likened this Association to a "holding company," while its numerous associated societies like the American Physical Society or the American Statistical Society are "operating companies"—to borrow the designations of the much abused public utility companies. The sum total of the membership lists of this Association and all its component societies is considerably more than three-quarters of a million, which figure may be taken as the measure of organized activity in pure and applied science in America.

* President, Massachusetts Institute of Technology. Address delivered before the American Association for the Advancement of Science, St. Louis, Mo., Dec. 30, 1935.

I have been asked to discuss the topic "What's Next in Science?" To answer this question properly, we need to consider where we are now and what has been our path in the past decades. Nowhere has this been more strikingly and comprehensively stated than in the preamble to a resolution adopted just a year ago by the American Association for the Advancement of Science and submitted to the President and the Congress of the United States, urging "that aggressive governmental support of scientific work is essential to any sound program of building for the future national welfare, and is essential if this country is to do its full part in the further advance of civilization and if it is to enjoy its proper share in the benefits of this advance."

The preamble to this resolution summarizes the importance and achievements of science in the following words:

"Development and application of science have been basic to the economic and social progress of nations, making possible such movements as universal education, abolition of child labor and slavery, emancipation of women, insurance and pensions, moderate hours of labor and great improvement in the standards of health, comfort and satisfaction in living.

"Scientific developments have not only conferred general benefits, but in particular have been largely effective in leading to recovery from previous depressions—as the railroad industry following the depression of 1870, the electric industry following that of 1896 and the automobile industry following that of 1907.

"Scientific research is a productive investment proven by experience to yield a high rate of return, as illustrated by the saving of $2,000,000,000 per year from the Bessemer steel process and of over $1,000,000 per day from the modern incandescent lamp, and as illustrated also by the entire chemical, electrical, communication, transportation and metallurgical industries and by the enormous employment in such industries.

"Progressive foreign nations have recognized the importance of maintaining their scientific strength at a high productive level and have provided for this maintenance by allocation of funds to support scientific work on a national scale.

"There now exists in America a situation demanding as never before an intelligent use of our national resources.

"There are manifold problems in health, safety, agriculture, better use of resources, development of new products and processes whose social value and urgent need are unquestioned but whose solution is being seriously hampered by lack of funds for research, which have been greatly curtailed at this time when properly directed scientific work is more than ever needed.

"The great national planning program, which is now under consideration for the use of our physical resources of soil, minerals and crops, will be seriously deficient unless it includes provisions for utilizing the scientific resources of the country for creative work."

What, in the light of this background, are some of the lines in which we may expect increased scientific activity in the near future? Let me suggest a few scientific problems of incalculable importance to the country.

1. Agricultural research in the past has led to greater yields of improved farm products. The great problem of agriculture today is to discover new uses for these products, uses which will create new social values or partially replace the consumption of our exhaustible natural resources.

Silk from wood, rubber from weeds, and motor fuel (alcohol mixed with gasoline) from corn or potatoes are actual examples of what can be done. Experience justifies belief that, along such lines, science may create new demands for farm products which will provide a constructive and permanent solution of the agricultural problem. This would be an infinitely better solution than the present emergency expedient of paying huge sums to induce farmers to raise less—to plow under crops and slaughter stock, in order that the rest of us, who pay that bill, will also have to pay more for our food. I believe that no one, not even among its proponents, is enthusiastic about this destructive and temporary scheme to benefit agriculture. I call it temporary because there are already signs that it is doomed to failure in the rapidly mounting imports of food products from foreign countries—an inevitable situation which will not only kill the scheme but be a body blow at American agriculture itself. Cotton, meat and wheat have been quick to respond to this invitation, by America, to foreign countries to seize not only America's foreign markets but to invade the home markets as well. How much more satisfactory would be a positive solution, based on scientific developments, which will create new industrial demands for farm products, and thus stimulate instead of depress agricultural activity. Of all the expenditures authorized by the last Congress, the one which seems to me wisest was the appropriation of funds to the Department of Agriculture for use in research for developing new outlets for farm products. This is an encouraging sign, and presages important future scientific activity in this line—an activity which will probably be centered largely in chemistry and chemical engineering.

2. I believe that a second line of increased activity in applied science will occur in industry—particularly in those industries which have hitherto depended largely on tariff protection, on monopolies, on exploitation of natural resources, on governmental subsidies or simply on momentum of past strength. These supports are temporary and precarious; sooner or later they fall before science, because no amount of artificial protection can permanently maintain an obsolete product, an inferior process or a moribund organization against competitors which are based on scientifically improved products or methods. Furthermore, the general public is ill-served by industries which lean upon legislative favors rather than upon wide-awake technical policies for existence, and the public, when it knows the facts, is likely to take strenuous measures. We have splendid examples in the electrical, communication, chemical and automotive industries, of industries which have met competition and have continually improved their service to the public through scientific research and the employment of technically trained men of highest caliber. And these industries are at the top of the list in prosperity. Contrast with these some other industries,

which you can think of without my naming them, which have not built up their organizations with technically trained men, which depend more on lobbying than upon science for their prosperity, which are suffering from types of competition which they themselves might have developed and profited by, had they been alert to the opportunities offered by science. The contrast is striking. There are some signs that it has struck home even in boards of directors. I believe that the scientist and the engineer will be called upon as never before to lead all along the line in our industrial fields.

3. In the medical field, we all know in a general way that there are great opportunities for scientific work. Few of us, who are not close to this field, realize how great the opportunities really are. For example, it is said that twenty per cent of all our state taxes go to the care of the mentally diseased. Think how great an investment, in money and in human happiness alike, it would be to pursue really actively those scientific leads which show any promise of prevention, alleviation or cure. Tropical diseases are a tremendous drain, not only in the tropics but also in our healthier climates. It has been estimated that an alleviation of certain enervating diseases in the tropics would so raise the standards of living in these regions as to create an increased purchasing power that would well repay the probable cost of the medical research and practice necessary to improve the situation. Cancer, infantile paralysis, the common cold, influenza and treatment by glandular extracts all suggest unsolved problems of medical science whose even partial solution would yield incalculable human as well as economic benefits.

Finally, the most important item of all is that the advancement of pure science should be fostered in every possible way. It is only as we learn about the materials, forces and operations of the world in which we live that we can wisely adapt ourselves to life in it and use these materials and forces to our own advantage. Pure science seeks to gain this knowledge and applied science, or engineering, seeks to use it in desirable ways. The two go hand in hand, and together their success epitomizes man's continual ascent to a richer, fuller, more satisfying life. Such are the objectives of the American Association for the Advancement of Science and its various affiliated societies which open their sessions in St. Louis today.

"It is sometimes instructive to appraise the value of scientific research in pecuniary terms. For example, take the very great improvements in electric power and electric lighting which have been made by the industrial scientists during the past twenty-five years. Were it not for these improvements the bill which the public is now paying for electric current would be greater by more than two billion dollars a year."—J. J. CARTY, in *Popular Research Narratives.*

The Degradation of Silk, Wild Silk and Wool by Steam

By EUNICE CHAMBERLIN WALDE, MILDRED BARR and RACHEL EDGAR *

Abstract

The degradation of silk and wild silk in one hour at 0 to 75 lbs. of steam per square inch and for one-half to five hours at 60 lbs., and of wool in one hour at 0 to 40 lbs. and for one to five hours at 10 lbs., has been followed by weight, nitrogen, sulfur and wet breaking strength. Degradation by steam has been shown to increase with increasing time or pressure and to be greater for wool than for the silks, and greater for wild silk than for silk. Mechanical failure of these protein fibres has been shown more rapid than loss of weight, nitrogen or sulfur, indicating a breakdown of fibrous structure preceding formation of soluble degradation products.

Introduction

PURIFICATION, conditioning,[30] crêping,[14] aging of dyeings, pressing, and setting of twist, embossed design, pile, and width have been accomplished by the action of steam on silk. Sterilizing, crabbing, and decatizing are other uses of steam for wool.

Early methods for purification by steam describe it as lowering the elasticity, luster, hygroscopicity, and softness of silk.[6, 11] Knecht once suggested steam at 130° C. for removing wool from the comparatively stable silk.[21] Ohara has recently shown the submicroscopic structure of silk broken down by steam in 10 hours at 100° C. or in three hours at 120°, 130°, or 150° C.[24]

Durant and Huguenin have recommended eight minutes steaming of silk for mordant dyeings fast to friction,[8] and Metzl has warned against steaming certain acid and substantive dyeings on silk for more than 10 minutes.[23] According to Driessen, only four to five minutes of steaming at 100° to 102° C. are required for aging.[5] Praetorius [26] has urged that steam pressures of 7 to 15 lbs. per sq. in. rather than 60 lbs. be used in the finishing of fabrics.[19]

Johnson records steaming of silk hosiery at a pressure of 5 lbs. and states steam pressures in excess of 90 lbs. should not be used for ironing silk.[18] For pressing fabrics, steam at 52 and 60 to 75 lbs. has been recommended to the dryeleaning trade.[5, 15]

* Dept. of Chemistry, Iowa State College, Ames, Iowa.

Elliott reports a silk fabric losing 58% of its average dry breaking strength after 25 hours in the moist heat of an autoclave at 100° C., and only 12% after 25 hours in the dry heat of an oven at the same temperature; at 120° C. the corresponding losses were 74 and 38%, while for a wool the values in the same order were 75, 5, 100, and 16%.[10]

Browning of silk and wool has been described by Fort as progressive with duration of steaming and greater at 100° C. than that brought about by boiling water or dry heat.[12]

A wool steamed at 99° to 100° C. for 3, 6, 12, 24, 36, 48, and 60 hours was observed by Scheurer to lose 18, 23, 28, 40, 50, 64, and 74% of its original strength.[29] Fulton and Staniford report that steam in 10 minutes at 12 lbs. or in one hour at atmospheric pressure sterilizes blankets and uniforms without damage to the wool, which becomes friable at 60 lbs. in 30 minutes.[13] Steam at 9 to 12 lbs. has been recommended for the finishing of wool,[3, 4] and steaming for 30 to 60 minutes has been recommended for mohair.[30] Reychler has noted that wool becomes less elastic at 110° to 120° C. and decreases 12% in weight and becomes friable when steamed at 135° to 150° C.[28] Speakman has discovered that resteaming wool without tension relaxes any permanent set acquired by previous steaming under tension.[32]

Fort has described steaming as increasing the dyeing property of wool[12] although Pokorný earlier reported three minutes steaming unfavorable to the subsequent fixation of acid dyes by wool[25] and no significant increase of its amino nitrogen by steam has been detected.[31] Astbury and Speakman have suggested steam first attacks the side linkages of the keratin molecule.[2]

The degradation of silk fibroin, wild silk fibroin, and wool keratin by steam is described in this article.

Experimental Procedure

Preparation of silk fibroin, wild silk fibroin, and wool keratin.—Silk crêpe, plain-woven in the gum, was boiled one hour in a 100-volume bath of 10% solution of neutral olive-oil soap, rinsed, boiled in another bath of the soap solution and then in water three times for 15 minutes each. Plain-woven pongee of wild silk and plain-woven wool were each boiled one hour in 100-volume baths of water, rinsed, boiled again in water for 15 minutes and thoroughly rinsed. The fabrics were cut into samples for analysis, extracted with anhydrous ether continuously for 18 hours in a modified Soxhlet extractor, and, with the exception of the breaking strength specimens, dried at 105° to 110° C. until successive weighings with tare checked within half a milligram. The silk fibroin, wild silk fibroin, and wool keratin yielded, respectively, 0.34, 0.60, and 0.30% of ash and the wool no sulfate[22] and but 0.21% of sulfite-yielding sulfur[16] as compared with 0.25% obtained from scoured wool fibre.

Steaming of silk and wool.—The silks and the wool were steamed in an autoclave capable of withstanding more than 100 lbs. of steam pressure per sq. in. and equipped with an accurate gauge and thermometer. The samples were hung on glass rods placed across Pyrex beakers so that no metal and no liquid which had flowed across metal came in contact with the fabrics which were protected from condensation by an inverted watch glass. The silks were steamed for one hour at 0, 15, 30, 45, 60, and 75 lbs. per sq. in.

and for one-half, one, two, three, and five hours at 60 lbs. The wool was steamed for one hour at 0, 10, 15, 20, 30, and 40 lbs., and for one, three, and five hours at 10 lbs. The residual fabrics were washed free of soluble degradation products by eight rinsings in water.

Analysis of silk and wool.—The wet warp breaking strength and elongation at breaking load of 10 specimens were determined with a Scott universal tester and autographic recorder immediately after rinsing.[1]

The steamed silks were dried at 105° to 110° C. before analysis for nitrogen by the Kjeldahl-Gunning-Arnold method.[17] The wool was dried at room temperature[28] and analyzed for nitrogen by the Kjeldahl-Gunning method.[17] Approximately four grams of silk and six grams of wool were used for an analysis and each value is the average of four determinations corrected for the nitrogen of the reagents.

Six-gram samples of wool were dried to constant weight at 105° to 110° C. before analysis for sulfur by the Benedict-Denis method.[7] The average of four determinations, corrected for the sulfur of the reagents is reported.

Table 1 shows the effect of steam in one hour on the weight, nitrogen, wet warp breaking strength and elongation at breaking load of silk and

TABLE 1

Effect of steam in one hour on the weight, nitrogen, breaking strength and elongation of silk fibroin and wild silk fibroin

Steam Pressure	Temperature	Residual Fibroins							
		Weight		Nitrogen		Breaking strength of wet warp		Elongation at breaking load	
lbs. per sq. in.	°C.	Silk % of	Wild Silk % of	Silk % of	Wild Silk % of	Silk lbs. per in.	Wild Silk lbs. per in.	Silk %	Wild Silk %
0	100.0	99.8	99.5	18.74	18.20	42	14	25	25
15	121.0	99.8	99.4	18.68	18.20	42	12	24	15
30	134.5	99.4	98.7	18.63	18.17	40	5	22	1
45	144.6	99.0	98.3	18.62	18.08	30	<1	16	—
60	153.0	97.8	95.7	18.40	17.45	24	<1	13	—
75	160.0	96.4	92.9	17.68	16.90	11	<1	4	—

wild silk at 0 to 75 lbs. per sq. in. Table 2 shows similar data for the two silks after one-half to five hours steaming at 60 lbs. Table 3 shows the effect of steam in one hour on the weight, nitrogen, sulfur, wet warp breaking strength and elongation at breaking load of wool at 0 to 40 lbs. per sq. in.; in Table 4 are shown similar data for the wool after one to five hours at 10 lbs. Fig. 1 compares nitrogen content with wet breaking strength for silk, wild silk, and wool after one hour at 0 to 75 lbs. Fig. 2 makes a similar comparison for silks at 60 and wool at 10 lbs. for one-half to five hours.

TABLE 2

Effect of time of steaming at 60 lbs. pressure and 153° C. on the weight, nitrogen, breaking strength and elongation of silk fibroin and wild silk fibroin

Time	Residual Fibroins							
	Weight		Nitrogen		Breaking strength of wet warp		Elongation at breaking load	
Hours	Silk % of	Wild Silk % of	Silk % of	Wild Silk % of	Silk lbs. per in.	Wild Silk lbs. per in.	Silk %	Wild Silk %
0	100.0	100.0	18.66	18.24	42	17	33	27
0.5		98.1		18.07		<1	—	—
1	97.8	95.7	18.40	17.45	24	<1	13	—
2	96.2		18.08		12		7	—
3	91.2	87.3	17.01	15.98	<1	<1	—	—
5	81.9	76.1	15.12	13.82	<1	<1	—	—

TABLE 3

Effect of steam in one hour on the weight, nitrogen, sulfur, breaking strength and elongation of wool keratin

Steam Pressure	Temperature	Residual Keratin				
		Weight	Nitrogen	Sulfur	Breaking strength of wet warp	Elongation at breaking load
lbs. per sq. in.	° C.	% of wool	% of wool	% of wool	lbs. per in.	%
0	100.0	99.4	16.44	3.88	13	50
10	115.2	99.0	16.44	3.74	11	55
15	121.0	99.1	16.25	3.75	8	40
20	126.0	98.9	16.36	3.75	2	49
30	134.5	98.7	16.13	3.68	<1	—
40	141.5	93.9	15.72	3.33	<1	—

TABLE 4

Effect of time of steaming at 10 lbs. pressure and 115.2° C. on the weight, nitrogen, sulfur, breaking strength and elongation of wool keratin.

Time	Residual Keratin				
	Weight	Nitrogen	Sulfur	Breaking strength of wet warp	Elongation at breaking load
Hours	% of wool	% of wool	% of wool	lbs. per in.	%
0	100.0	16.49	3.99	15	56
1	99.0	16.44	3.74	11	55
3	99.1	16.39	3.76	7	42
5	98.6	15.80	3.69	2	47

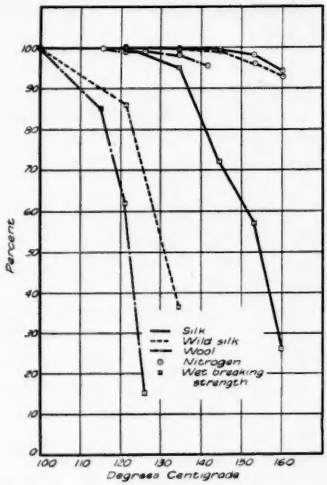

FIG. 1. Effect of steam in one hour on the nitrogen and wet breaking strength of silk, wild silk, and wool.

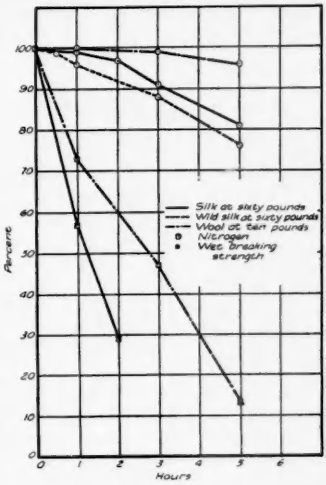

FIG. 2. Effect of time of steaming on the nitrogen and wet breaking strength of silk and wild silk at 60 lbs. and wool at 10 lbs. per sq. in.

Browning of the silks increased with time and temperature of steaming and the wild silk became very dark when steamed two or more hours at 60 lbs. In one hour at 20 lbs. wool assumed a grey tinge and at 30 lbs. became very brown and friable.

References

(1) "A. S. T. M. Standards on Textile Materials," p. 1. American Society for Testing Materials, Philadelphia, 1933.

(2) Astbury, W. T., and Speakman, J. B. *J. Soc. Dyers Col., 50,* 24–45 (1934).

(3) Atkinson, G. *Am. Dyestuff Rptr., 23,* 112–4 (1934).

(4) Atkinson, G. *Tex. Mfr., 59,* 158 (1933).

(5) Brannt, W. T., and Gray, J. B. "Practical Dry Cleaner Scourer and Garment Dyer," sixth ed. p. 214. Henry Carey Baird and Co., New York, 1929.

(6) Cramer, E. *J. prakt. Chem., 96,* 76–98 (1865).

(7) Denis, W. *J. Biol. Chem., 8,* 401–3 (1910).

(8) Driessen, P. A. *Mell. Textilber., 9,* 670–1 (1928).

(9) Durand and Huguenin Soc. Anon., French Patent 755,351 (Nov. 23, 1933).

(10) Elliott, M. *Thesis,* Iowa State College, 1928.

(11) Fischer, E., and Skita, A. *Z. physiol. Chem., 33,* 177–92 (1901).
(12) Fort, M. *J. Soc. Dyers Col., 32,* 184–7 (1916).
(13) Fulton, D., and Staniford, K. J. *J. Am. Med. Assoc., 71,* 823–4 (1918).
(14) Gantillon, D. British Patent 14,246 (Sept. 10, 1890).
(15) Gaubatz, G. G., Jr. "Modern Methods in Dry Cleaning," pp. 84–6. National Association of Dyers and Cleaners, Silver Spring, Md., 1931.
(16) Goodall, F. L. *J. Soc. Dyers Col., 50,* 10–3 (1934).
(17) Griffin, R. C. "Technical Methods of Analysis," pp. 65–6. McGraw-Hill, New York, 1921.
(18) Johnson, G. H. "Textile Fabrics," p. 65. Harpers, New York, 1927.
(19) Kaufman, H. M. *Tex. Col., 56,* 759–60, 778 (1934).
(20) Kegel, W. *Monatschr. Textil-Ind., 43,* 171 (1928).
(21) Knecht, E. *J. Soc. Chem. Ind., 10,* 230 (1891).
(22) Mease, R. T. *B. S. J. Rsch., 13,* 617–23 (1934).
(23) Metzl, H. *Mell. Textilber., 15,* 561–2 (1934).
(24) Ohara, K. *Sci. Papers Inst. Phys. Chem. Research (Tokyo), 21,* 104–27 (1933).
(25) Pokorný, J. *Rev. gén. mat. color., 12,* 65–8 (1908).
(26) Praetorius, E. *Rayon and Mell. Tex. Mo., 15,* 77–8, 129–31 (1934).
(27) Raynes, J. L. *J. T. I., 18,* T46–7 (1926).
(28) Reychler, A. *Bull. soc. chim. Belg., 29,* 291–300 (1920).
(29) Scheurer, A. *Bull. soc. ind. Mulhouse, 63,* 89–93 (1893).
(30) *Ibid., 70,* 89–91 (1900).
(31) Speakman, J. B. *J. Intnl. Soc. Leather Trades' Chem., 16,* 95–111 (1932).
(32) Speakman, J. B. *Trans. Faraday Soc., 25,* 169–76 (1929).

Sweet Potato Starch

RESEARCH conducted under the Auspices of the U. S. Bureau of Standards at the Alabama Polytechnic Institute * has resulted in the production of sweet potato starch on a commercial scale at a government-controlled plant at Laurel, Miss., having an annual capacity of 2,500,000 lbs. The Carbohydrate Division of the Bureau of Chemistry and Soils, Department of Agriculture, was responsible for starting this plant. Previously, the value of sweet potato starch as a sizing material had been tested under semi-commercial conditions at Alabama Polytechnic, and also under mill conditions at the mill of the Pepperell Manufacturing Co., Opelika, Ala. It is reported that the use of small amounts of dispersed lecithin and lanum tends to stabilize the viscosity of sweet potato starch.

* *B. S. J. Rsch., II,* 12, 765.

British Textile Research During 1934-35

AN increase of 30% in the resources of the research associations operating under the Department of Scientific and Industrial Research of Great Britain, is credited in the report of the department for the fiscal year 1934–35 as being the most encouraging development. This has resulted from increased support by the various industries and that of the Government on a pound-for-pound basis, as compared with 18 months previously. There are 42 of these research associations, but the only textile organization reporting a large increase in resources is that for the cotton industry.

As in other recent annual reports the advisory council of the department again emphasizes the fact that only those firms which are "research-minded," or have men who are, can benefit directly from basic research. "Neither in the directorates nor among the technical and executive staffs," it states, "is sufficient weight yet given to scientific attainment and experience." It is because of this situation that several of the research associations, and notably the Cotton Industry Research Association, are devoting a large part of their effort to actual application of scientific research results in co-operating mills.

The following summary of the work during 1934–35 of the textile research associations appeared in the January issue of the *Textile Manufacturer:* The Industrial Health Research Board is carrying out an investigation to determine the effect of improved artificial illumination in the textile industries. The Fabrics Research Committee is being dissolved, but has to make its final report, which will include tests on methods of fireproofing fabrics.

Cotton Industry Research

Large increases in direct subscriptions to the British Cotton Industry Research Association from the industry are now assured, and building extensions are practically complete. The new buildings will consist of two connected main blocks, one of laboratories, and one for machinery for experimental purposes. The total floor space now available is nearly 80,000 square feet. One great advantage of the new machinery block is that it is a single-storey building, and therefore less subject to structural vibration than the present experimental workrooms. It is designed to give the greatest possible ease of control of temperature and humidity. Direct sunlight cannot enter the building, which will have adequate north lighting. The space available will be used almost entirely for experimental weaving, and preparation machinery and cloth rooms which will be in close proximity. There will be accommodation for nearly one hundred looms, some of which will be removed from the present machinery rooms to make way for new spinning plant, which new plant will include a complete range of "waste" spinning machines.

During the past year the institute has carried out many practical tests of the value of equipping one room with special lighting for the inspection of defective fabrics. The lighting arrangements will include two qualities of diffused light, one being artificial daylight and the other ordinary electric light, beams of parallel light which can be thrown on to the fabric at any desired angle, arrangements for transmitting parallel or diffused light through the fabric, and ultra-violet light. Each of these systems of lighting will emphasize different points in the construction and finish of the fabrics examined.

Another outstanding feature of the new laboratory block will be the provision of a central hall with a larger floor space than any existing single room. This will be of great value for meetings and for exhibiting cinematograph films.

The first production machine on the "streamline" principle of cleaning cotton is now on the market. This machine, known as the Shirley Lint Recoverer, is for extracting from various kinds of mill wastes the good spinnable fibre that they contain.

The work of the Rayon Department continues to expand. The number of special enquiries concerning it constituted more than one in every six of the total number received, whereas in the previous year the proportion was less than one in seven. Real silk requires different chemical methods, but many of the physical problems involved are identical with those for rayon, and much of the apparatus and equipment used for rayon is equally suitable for silk.

The work for the Empire Cotton Growing Corporation consists in making complete spinning tests on all samples of cotton submitted by them. The mass of data thus being accumulated is proving very valuable in the attack on what is one of the most difficult and at the same time most vital unsolved problems of the industry—the relation between the characteristics of the individual cotton hairs and their suitability for making good yarn. Work of a similar kind is done for the Lancashire Indian Cotton Committee, and some fifty tests are made annually for the Egyptian Government.

Wool Industries Research

Considerable progress has been made in perfecting, for use on a commercial scale, the process developed in the laboratories of the Association for the production of shrinkage-resisting wool. The process has advantages over existing well-known wet methods of treatment which produce in knitted or woven material a degree of unshrinkability. This is due to the fact that the new method is applicable to the treatment of wool in the loose form, as slubbing, or as yarn. Experiments in the spinning, weaving, and knitting of wool so treated have shown that new fields of use for wool will become available by the exploitation of the distinctive characteristics of what may be regarded as a new fibre.

Work has been in progress on fibre breakage during carding and preparing. The study of the fundamental functions of carding has been continued and extended to the measurement of the bending of card wires. Investigation has shown that attention could profitably be paid to more suitable design of the early part of the card.

The state of the wool subsequent to scouring is one of the most important factors affecting breakage. The alkalinity or pH of raw wool

scouring liquors must be controlled in order to produce uniform results, since the detergent action of the liquors is dependent on their pH values, whilst the strength and stability of the scoured wool are also influenced by the pH value of the final liquor with which it reaches equilibrium. In the first liquor the aim is to ensure that the natural suint emulsifies the maximum amount of wool grease; in the second liquor, the desired amount of the residual grease is removed by the aid of soap and soda; whilst in the third, and any subsequent bowls, excessive amounts of alkali are removed from the wool. Mill and laboratory investigations have shown:—

(1) that, provided the pH value of the first liquor containing suint is kept above pH 8 by means of sodium carbonate, its power to emulsify wool grease is at a maximum;

(2) that the emulsifying power of the second liquor—the soap solution—rises sharply at pH 10, and more sharply when sodium carbonate is added than when trisodiumphosphate, sodium metasilicate or sodium hydroxide is added to adjust the pH value;

(3) that when the pH value of the third liquor is adjusted by the addition of sodium hexametaphosphate, not only does the liquor remove objectionable calcium and magnesium soaps from the wool, but the same operation ensures that it is not too alkaline for subsequent processes.

Favourable reports have been obtained on a new "let-off" motion which positively controls the warp threads in the loom. Possibilities of further progress have been indicated, as a result of improvements in warp control in the loom, showing the existence of irregularities in processes preliminary to weaving. Similarly in spinning, limitations in the use of cotton frames for high drafts have led to recognition of the need for more precise knowledge of the action of "false-twist" tubes.

It is hoped that the finances of the Association will be established on a permanent and more satisfactory footing.

Linen Industry Research

To secure the maximum expansion of research with the increased income there has been considerable internal reorganization. New machinery sheds for research in preparing and spinning have been made available and equipped and an entirely new weaving shed has been brought into use.

Several items of applied research have reached the stage where continuous large-scale production is a condition of further progress. Two of these, chemical retting and long draft spinning, have been recommended for development with the aid of special contributions.

A flax crop of 190 acres was grown in Norfolk in 1934 and a crop of 260 acres in 1935. The necessary barns, weighbridge, power plant and deseeding plant were erected on a suitable site on the Sandringham estate and the de-seeding of the 1934 crop was undertaken in the Spring of 1935. The necessary retting and scutching plants are now in course of erection. The whole of the botanical and fibre processing section has been transferred there.

Investigations on regularity of sliver, rove and yarn, effect of reach in spinning, and the measurement of strength of yarn have been continued. Further work has been carried out on the improved process of spinning and special arrangements made for proceeding with this on a larger scale. A process for the production of a novel type of linen yarn has been evolved

and this is being developed commercially by several members. Further developments of the same process are in progress for the treatment of fibre and straw, and it appears that they may have many important applications in connection with the general problem of fibre production.

Considerable time has been devoted to the measurement of warp and weft tensions during weaving. Several new methods have been completed and useful data obtained; an attachment for works use on looms has been designed and described. The modified self-twilling Jacquard machine, giving reverse twill in ground and pattern, has successfully passed a long and searching factory trial, and arrangements are being made for its manufacture; this machine enables improvements to be made in the manufacture of some types of damask cloths, resulting in increased resistance to laundry wear. An attachment has been designed which provides a simple means of producing a large variety of pattern effects on woven cloths, and commercial development by members is in progress.

The institution on 1st May, 1935, of research work on sisal fibre by the Linen Research Institute has necessitated the establishment of a new department whose activities will be confined to the solution of problems dealing with the utilization of sisal and its waste products, and the development of a larger field of use for this fibre. Provision has been made for fundamental investigation into the physical and chemical properties of the fibre.

Special Course in Research

THE eighth session of the School for Textile Research will be conducted by Edward R. Schwarz, Associate Professor of Textile Engineering, at Massachusetts Institute of Technology, Cambridge, Mass., starting March 20 and closing April 25. To enable executives, research directors and others in and near the New England states to take advantage of the course with little or no loss of time from their regular occupations, the lectures, laboratory work and conferences are held only on Fridays and Saturdays. Approximately 100 hours of work are covered; the class is limited to 20; the tuition is $50; registration will close March 16. For a syllabus of lectures and other information address Prof. Schwarz or Dr. J. L. Tryon, Director of Admissions.

(*Continued from P. 230*)

The curtailment of their fundamental research programs by the British associations was coincident with notice from the Department of Scientific and Industrial Research that the "million-pound fund" was so depleted that manufacturers must co-operate more adequately in research financing. The programs were not reduced because the wells of new scientific textile knowledge had been plumbed to their depths and drained dry, but because the textile research plants had to find some means of raising more money from their industries. As they were not organized and operated upon a co-operative basis of effort, but were held wholly responsible for research and its results, it became necessary for them to provide new services that would appeal to the pocket nerves of manufacturers. One of the new services involves showing co-operators how to apply in their processing existing results of basic research, in return for which service the mills contribute to its financing. As at present organized this involves additional expense for an increased staff to service the mills, and naturally leads to the need of complete mill equipment for experimental and applied work at the research plants.

The associations in this country which are engaged in organized textile research on a co-operative basis, and also the Textile Foundation, have recognized that the interpretation to the technicians of the industry of results of basic research which may have practical application is a service that they should provide. Their ability to provide this service has been demonstrated. They have not, however, anticipated that they would be expected by the industry, or that part of it which is co-operating in their work, to lead the way in the actual application of new textile knowledge. They have assumed that the manufacturers who are sufficiently interested in basic research to be willing to co-operate in its organization, financing and conduct would be prepared, and would prefer for selfish reasons, to apply the interpreted results in their mills. The capitalization of the results would then depend upon the ability of their own technicians and scientists, or upon that of the consultants who might be employed for that specific purpose.

These policies are logical results of a research system which organizes, finances and conducts fundamental research upon a co-operative basis and utilizes existing facilities for such work. Lacking facilities for the practical application of new basic knowledge the research associations are neither expected nor tempted to engage in such servicing of their co-operating mills, and the latter in the applied work retain their competitive individuality.

Had the domestic research associations started with well equipped and staffed laboratories, as did the British associations, and had they later faced financing difficulties similar to those met by the British associations, then their policy in respect to the servicing of co-operating mills and in the extension of buildings, equipment and staffs to provide such service, could hardly have been different. As it is possible that eventually domestic associations may be asked to provide applied research servicing, at least in some modified form, the experience of the British associations along this line may prove invaluable. At the moment, however, it seems unfortunate that facilities and staffs equipped primarily to provide needed new scientific knowledge should be employed in large part on applied research and "trouble-shooting" that any efficiently staffed, modern mill should expect and prefer to handle as a part of its routine work.

Abstracts

This section is compiled under the direction of the Committee on Abstracts and Bibliography: Prof. E. R. Schwarz, Chairman, M. W. Weiss, Dr. Irving J. Saxl and C. H. Clark.

I. Fibres (Synthetic and Natural) and Fibre Analysis

Adsorption of Caustic Soda by Cellulose. W. D. Bancroft and J. B. Calkin. *J. Phys. Chem.*, 1935, V. 39, P. 1–9; *Paper Trade J.*, Nov. 7, 1935, P. 44. (C)

Adsorption of Organic Liquids by Cellulose Products. J. Wiertelak and I. Garbaczowna. *Ind. Eng. Chem., Anal. Ed.*, Mar. 15, 1935, P. 110; *Paper Trade J.*, Oct. 3, 1935, P. 42. (C)

Alkalis and Wool. Fredk. R. Harrison. *Tex. Wld.*, Nov. 1935, P. 87.

Recent investigation shows possibility of decreasing scouring costs. (C)

Anthrax Is Preventable. Ian G. Macdonald. *Tex. Wld.*, Nov. 1935, P. 78.

Recent investigations show effectiveness of wool sterilization and other precautions. (C)

Cellulose: Methylene Blue Number of. M. Brissaud. *Mem. Poudres*, 1934–5, V. 26, P. 93–100; *Tiba*, Dec. 1934, P. 913–7; *Paper Trade J.*, Oct. 3, 1935, P. 42. (C)

Cellulose: Nature of. An Historical Review. E. Heuser. *Paper Trade J.*, 1935, Nov. 21, P. 39–46; Nov. 28, P. 35–41; Dec. 5, P. 39–42. (C)

Cellulose: Refractive Power of—and Its Derivatives. I. Influence of Noncellulosic Impurities on Refractory of Cellulose Fibres. II. Influence of Oxidation and Hydrolysis on Refractivity of Cellulose Fibres. III. Influence of Adsorbed Water on the Refractory Power of Cellulose Fibres. K. Kanamaru. *Helv. Chim. Acta*, 1934, V. 17, P. 1047–72, 1425–29; *Paper Trade J.*, Nov. 7, 1935, P. 43–4. (C)

Cellulose Membranes: Formation and Structure of. Wanda K. Farr. *Paper Trade J.*, Sept. 26, 1935, P. 87.

In conclusion it is emphasized that the data presented concern cellulose membrane formation and not cellulose formation. Observations have fur-

nished no information concerning the origin of the cellulose itself from the extremely complicated chemical and physical relationships of the living protoplasm. When first identified it is in the form of the cellulose particle. Nor is there any basis at present for applying these data to the presumably more complex lignified and suberized plant cell membranes. (C)

CELLULOSIC SUBSTANCES: DETERMINATION OF VISCOSITY FOR CHARACTERIZATION OF. I. Sakurada. *Cellulose Ind.* (Tokyo), 1934, V. 10, P. 197–203; *Paper Trade J.*, Oct. 3, 1935, P. 42. (C)

CHEMISTRY OF CELLULOSE. H. Staudinger. *Naturwiss.*, 1934, V. 22, P. 797–803; *C. A.*, 1935, V. 29, Col. 1979; *Paper Trade J.*, Oct. 3, 1935, P. 41. (C)

DEGUMMING OF REAL SILK MATERIALS. A. J. Hall. *Am. Dye. Rptr.*, Nov. 18, 1935, P. 666. (C)

WOOL FIBRE: OILING OF THE. Walter Obst. *Monatschr. Textil-Ind.*, 1935, V. 50, P. 149–50.

A review dealing with oiling operations, effects of the pH of the solns., characteristics of the emulsions, and the properties of a textile oil. The prepn. of a good textile oil is described. (From *C. A.*, 1935, V. 29, Col. 6431.) (W)

WOOL-LIKE RAYON AND ARTIFICIAL WOOL. Fritz Ohl. *Spinner u. Weber*, 1934, V. 52, No. 40, P. 8–11; cf. *C. A.*, 1935, V. 29, Col. 7664, 8345.

A review of the patent literature and a comparison of the phys. properties of the two materials. (W)

X-RAY DIFFRACTION PATTERN OF NATIVE CELLULOSE: FURTHER INVESTIGATION OF. U. Yoshida and C. Park. *Mem. Coll. Sci. Kyoto Imp. Univ.*, 1934, V. A17, P. 443–7.

Re-examn. of the fibre diagram of native ramie cellulose in Fe and Cr radiation shows that the previously proposed tetragonal cell (cf. *C. A.*, V. 26, P. 590) is incorrect, but that the accepted monoclinic cell with $a = 8.22$, $b = 10.33$, $c = 7.84$ and $\beta = 84°$ is confirmed. The diagram in Cr radiation shows a previously unreported reflection on the equator; its indexes are 100, or 001, or both. (From *C. A.*, 1935, V. 29, Col. 6421.) (W)

X-RAY STUDIES OF THE STRUCTURES OF HAIR, WOOL AND RELATED FIBRES. III. CONFIGURATION OF THE KERATIN MOLECULE AND ITS ORIENTATION IN THE BIOLOGICAL CELL. W. T. Astbury and W. A. Sisson. *Proc. Roy. Soc.* (London), 1935, V. A150, P. 533–51; cf. *C. A.*, 1934, V. 28, Col. 3238; 1935, V. 29, Col. 3521, 6065; *Science Abs.*, Sept. 1935, Col. 3255; *J. T. I.*, Oct. 1935, P. A539.

When pressed in steam or hot H_2O, α-keratin fibres are transformed to β-keratin, the crystallites of which rotate about their long axes, bringing the protein chains parallel to the pressure. Direct detns. show that the "backbone" and "side-chain" spacings of the keratin "grid" are perpen-

dicular. The crystallites of β-keratin are broader in the direction of the "backbone" spacing than in that of the "side-chain" spacing. The biol. cells in keratinous structures are generally flat and arranged with their flat sides approx. parallel to the natural specimen surfaces. The protein side chains are not naturally perpendicular to the cell wall; selective orientation under pressure is thus not simply a consequence of cross-sectional deformation. Within the cell the keratin grids are randomly oriented about the fibre axis; orientation phenomena are explained in terms of the flat crystallites and the action of steam on the keratin grid cross-linkages. The mechanism of the evolution of fibrous proteins is discussed with reference to the results obtained from X-ray studies of other proteins. Twenty references. (W)

II. Yarns and Fabrics

Contraction in Twisting Rayon Yarns. H. R. Mauersberger. *Rayon & Mell. Tex. Mo.*, Oct. 1935, P. 56.

A review of work on this subject and the reliability of results. (C)

Cotton Filling Materials: New Method for Distinguishing Between New and Second-hand. S. Moskowitz, W. Landes and D. Himmelfarb. *Am. Dye. Rptr.*, Aug. 12, 1935, P. 463.

Describes a method for the determination of ammonia and urea in cotton materials. Unused cotton materials have both an ammonia and urea content of less than 0.030% and 0.010% respectively. Used cotton fillings will have in most cases either an ammonia content above 0.030% or a urea content above 0.010% or both. Garnetting cotton materials into felt does not alter the ammonia and urea contents. (C)

Cotton Opening Machinery. An Outline of the Fundamental Principles of Opening and Cleaning. C. R. D. *Tex. Mfr.*, Nov. 1935, P. 439. (C)

Crease-resisting Fabrics. Chester Amick. *Am. Dye. Rptr.*, 1935, Oct. 7, P. 553; Nov. 4, P. 622; Nov. 18, P. 645.

Fibre properties favorable to crease-resisting treatment; the materials and methods of treatment; finishing; laboratory control; qualities of crease-resisting fabrics. (C)

Crêpes and Crêpage. *Tex. Wld.*, Sept. 1935, P. 99.

A symposium including the following articles: Rayon Manufacturers' and Weavers' Views, B. L. Hathorne. Throwing Operation is Crucial Point, C. W. Bendigo. Warp Preparation and Weaving Important, Anon. Finishers' Control of Pebble and Take-up, Ray Cottrell. Determination of Crêpage in Yarns and Fabrics, Irving J. Saxl. (C)

Cuprammonium Crêpes: Throwster Must Learn New Rules When He Turns His Hand to. I. G. Sanford. *Tex. Wld.*, Dec. 1935, P. 64. (C)

DRAFT. Fay H. Martin. *Cotton*, July, 1935, P. 79.

A practical discussion of principles and of rules and calculations. This is the first of a series of articles, the others being as follows: Twist, Aug., P. 79; Lay, Sept., P. 90; Tension, Nov., P. 84. (C)

DRYING: NEW METHODS IN. *Tex. Mfr.*, Oct. 1935, P. 413.

High thermal efficiency is obtained in drying, etc., with very compact enclosed machines, by splitting up a hot-air current into fine streams, balancing the pressures on either side of the fabric, and obtaining a cooling effect on the fabric by the quick drying. (C)

DRYING: SOME FUNDAMENTAL PRINCIPLES OF. E. A. Fisher. *Tex. Mfr.*, Nov. 1935, P. 449.

Abstract of a paper, *J. Soc. Chem. Ind.*, Oct. 18, 1935, P. T344. Some factors which have a bearing upon efficiency of drying, output of drying machines, and effect on material. (C)

FINISHING FROM A CHEMICAL ENGINEERING STANDPOINT. J. E. Howarth. *Tex. Mfr.*, Dec. 1935, P. 513.

Examples of principles in the design and choice of equipment for various finishing processes. (C)

GELATINES: PLACE OF—IN SYNTHETIC YARN WARP SIZING. W. L. Bentley. *Rayon & Mell. Tex. Mo.*, Nov. 1935, P. 44. (C)

LATEX: APPLICATION OF—TO TEXTILES. R. Gaunt. *Tex. Mfr.*, Aug. 1935, P. 341. (C)

LAUNDERABILITY OF TEXTILES: BIBLIOGRAPHY ON. L. M. Gugelman. *Am. Dye. Rptr.*, Oct. 21, 1935, P. 593.

References cover the period from 1910 to 1934 inclusive. (C)

LOOM: A NEW PICK-CYCLE STATIONARY-SLAY HIGH-SPEED COARSE. *Tex. Mfr.*, Sept. 1935, P. 373.

A new loom has a stationary reed with special beating-up and other arrangements whereby picking starts while the previous pick is being beaten up. The loom has been commercially adopted for weaving jute, and is suitable for any cloth of open mesh. (C)

MOISTURE CONTENT AS RELATED TO THE FINISHING OF WOOLENS. G. L. Atkinson. *Am. Dye. Rptr.*, July 15, 1935, P. 387. (C)

OILING OF WOOL. J. B. Speakman and J. R. Greenwood. *Tex. Mfr.*, July, 1935, P. 281; *Tex. Rec.*, June 15, 1935, P. 53.

Antioxidants for both vegetable and mineral oils and their uses are described, also methods for the easy removal of such oils in scouring. Also reports results of a study of the lubricating and adhesive properties of different oils used for oiling wool. (C)

PHYSICAL PROPERTIES OF CLOTHING FABRICS. A. H. Pettinger. *Tex. Rec.*, 1935, April, P. 43; July 15, P. 20. (C)

PHYSICAL PROPERTIES OF RAYON AND ACETATE YARNS IN RELATIONSHIP TO SOME TEXTILE MANIPULATIONS. J. A. Van Laer. *Rayon & Mell. Tex. Mo.*, Nov. 1935, P. 69. (C)

RAYON: NEW RESEARCHES UPON THE REFRACTIVE INDEX OF VARIOUS TYPES OF. Paul-August Koch and H. Rückert. *Mell. Textilber.*, 1935, P. 493; *Rayon & Mell. Tex. Mo.*, Oct. 1935, P. 77. (C)

RAYON: RECOVERY PROCESS REDUCES CHEMICAL COSTS IN SOAKING. Peter C. Wayner. *Tex. Wld.*, Nov. 1935, P. 92. (C)

RAYON FABRICS: PRODUCTION OF UNCRUSHABLE. *Kunsts.*, 1935, P. 351; *Rayon & Mell. Tex. Mo.*, Dec. 1935, P. 71.

The present state of the production of uncrushable rayon and rayon tissues is discussed. (C)

RAYON FABRICS: REMOVAL OF STAINS FROM. H. Roche. *Tex. Mfr.*, July 1935, P. 294. (C)

RAYONS (VISCOSE PROCESS) FOUND STRONGER THAN COTTON ON WEIGHT BASIS. *Tex. Bull.*, Nov. 7, 1935, P. 16.

Paper read by George Fuller, of Cox & Fuller, at the meeting of Rayon Sub-committee A-2 of Committee D-13 of A. S. T. M. (C)

SIZES FOR ACETATE RAYON WARPS. A. Eichler. *Mell. Textilber.*, 1935, P. 658; *Rayon & Mell. Tex. Mo.*, Dec. 1935, P. 71.

The sizes which the author found to be satisfactory in the course of his tests have been classified in three groups, *viz.*, synthetic resin-like bodies, such as Vinarol; bodies which have been prepared by the chemical treatment of natural colloids, such, for instance, as Blufajo Size and Sikovan K; and thirdly, products consisting of drying oils or their derivatives. The products of the first two groups have the great advantage compared with linseed oil especially that the warp can easily be de-sized, besides which they replace the valuable linseed oil without creating any difficulty in the supply of raw materials, because the domestic supply is able to meet any demands. (C)

SIZING OF RAYON WARPS. *Mtsh. S. u. Ksts.*, 1935, P. 70; *Rayon & Mell. Tex. Mo.*, Oct. 1935, P. 77.

The article gives a brief description of various German patents on processes for the sizing of rayon. Recipes for the preparation of suitable sizes for cellulose acetate are given. Other sizes for rayons mentioned are solutions of resins, waxes, metal salts of fatty acids, oils and mixtures of these products in anhydrous organic solvents. (C)

SLASHER ROOM. Jos. W. St. Rock. *Cotton*, July, 1935, P. 38; Aug., P. 50; Sept., P. 62.

Discussion by a practical mill man of the slasher room, its equipment, methods, etc. (C)

SPINDLE SPEEDS AND YARN TENSION IN RING SPINNING. *Tex. Mfr.*, Oct. 1935, P. 417.

The range of variation in thread tension in ring spinning has been determined by a new instrument. A direct-current variable-speed motor and a three-point regulator give an improved control of spindle speed variation with advantageous results. (C)

SPINNING LIMIT: RAISING THE—OF COMBING OF GOOD QUALITY INDIAN COTTONS. R. P. Richardson and Nazir Ahmad. *Tex. Mfr.*, Aug. 1935, P. 311. (C)

III. CHEMICAL AND OTHER PROCESSING (NOT OTHERWISE CLASSIFIED)

ABSORPTION OF DYESTUFFS BY VISCOSE. STRETCHED YARNS AND THEIR AFFINITY FOR DYESTUFFS. A. M. Patel. *Am. Dye. Rptr.*, Dec. 16, 1935, P. 716. (C)

ALIPHATIC ORGANIC CHEMICALS IN TEXTILE PROCESSING. N. D. Harvey, Jr. *Am. Dye. Rptr.*, Sept. 9, 1935, P. 508. (C)

AZOIC COLOURS. *Tex. Mfr.*, Nov. 1935, P. 470.

A symposium on the use of naphthols and fast colour "Salts" at meeting of the Manchester Section of the Society of Dyers and Colourists. (C)

BLEACHING: INFLUENCE OF METALS IN. A. H. Pettinger. *Tex. Mfr.*, Nov. 1935, P. 472.

In peroxide bleaching it is essential to avoid iron and copper and chromium salts, but tin and titanium have no deleterious effect, and Monel metal vessels can be used. (C)

BLEACHING OF VEGETABLE FIBRES: SCIENTIFIC PRINCIPLES INVOLVED IN. M. Jaffard. *Tiba*, 1933, V. 11, P. 167; *Am. Dye. Rptr.*, Dec. 30, 1935, P. 730. (C)

BLEACHING AND CAUSTICIZING COTTON IN THE COLD. E. Justin-Mueller. *Tiba*, 1934, V. 10, P. 911; *Am. Dye. Rptr.*, Oct. 21, 1935, P. 603. (C)

BLEACHING COTTON PIECE GOODS WITH HYDROGEN PEROXIDE. R. E. Rupp. *Cotton*, Nov. 1935, P. 45. (C)

BOIL-OFF, DYEING AND FINISHING OF ACETATE/RAYON AND ACETATE/SILK CRÊPES I. PREPARING FOR BOIL-OFF. PRECAUTIONS AND TESTING OF GOODS. II. DYEING OF ACETATE/RAYON AND ACETATE/SILK CRÊPES. III. DYEING OF A DEVELOPED BLACK ON ACETATE/RAYON CRÊPE FABRICS. IV. DYEING OF A SOLID SHADE ON ACETATE/RAYON OR ACETATE/SILK. V. FINISHING OF ACETATE/SILK AND ACETATE/RAYON CRÊPES. E. Herzog. *Rayon & Mell. Tex. Mo.*, 1935, V. XVI, P. 341, 381, 437, 509, 589. (C)

CELLULOSE: DIRECT DYEING OF. INFLUENTIAL FACTORS CONTROLLING DYE ABSORPTION. S. M. Neale. *Tex. Rec.*, Sept. 15, 1935, P. 45; *Am. Dye. Rptr.*, Nov. 18, 1935, P. 661. (C)

CHEMISTRY OF SILK AND SILK PROCESSING: DEVELOPMENTS DURING 1934 IN THE. Walter M. Scott. *Am. Dye. Rptr.*, Aug. 12, 1935, P. 443.

This article is the second in a series of reviews written exclusively for this journal. The first review appeared last year in this journal, starting with Issue No. 9. It summarized the progress which had been made up to the end of the year 1933 in connection with the fundamental chemistry of raw silk and the chemical processes which play a part in the transformation of raw silk into finished fabric. The present review continues the story through the year 1934. As in the previous article, the subject is divided into the following chapters: Chemistry of Raw Silk; Soaking of Silk; Degumming of Silk; Weighting of Silk; Dyeing and Finishing of Silk. (C)

COLOR: ITS CHARACTER, PERCEPTION, MEASUREMENT AND REPRODUCTION. R. E. Rose. *Am. Dye. Rptr.*, June 17, 1935, P. 334–8, 340.

A paper presented at January meeting, R. I. Section of A. A. T. C. C., Jan. 25, 1935. (C)

CORN STARCH AND CORN GUMS: CHARACTERISTICS OF—AS RELATED TO PRINTING THICKENERS. C. Norris Rabold. *Am. Dye. Rptr.*, July 15, 1935, P. 395. (C)

DELUSTERING OF AND DAMAGE TO ARTIFICIAL SILK. Fritz Ohl. *Monats. f. Seide u. Kunstseide*, 1933, V. 38, P. 298; *Am. Dye. Rptr.*, July 15, 1935, P. 413. (C)

DESIZING AGENTS. Anon. *Tex. Wld.*, Oct. 1935, P. 89–90.

Factors which influence results obtained with four types of enzymes. (C)

DYEING WITH ACID DYES: PRINCIPLES OF. L. R. Parks and P. G. Bartlett. *Am. Dye. Rptr.*, Aug. 26, 1935, P. 476. (C)

DYEING WITH BASIC DYES: PRINCIPLES OF. L. R. Parks and P. G. Bartlett. *Am. Dye. Rptr.*, Sept. 23, 1935, P. 529. (C)

DYEING WITH SALT DYES: PRINCIPLES OF. L. R. Parks and H. C. Beard. *Am. Dye. Rptr.*, Oct. 7, 1935. (C)

DYESTUFFS: A CLASSIFICATION OF. L. R. Parks and H. C. Beard. *Am. Dye. Rptr.*, June 17, 1935, P. 331–2.

A classification based on the theory of solutions and colloids. Contribution from the Pond Chemical Laboratory of Penn State College. (C)

FADING OF DYED TEXTILES. FACTORS WHICH INFLUENCE IT; INSTRUMENTS FOR TESTING FASTNESS. A. C. Goodings. *Am. Dye. Rptr.*, Nov. 18, 1935, P. 663. (C)

FADING OF DYEINGS IN RADIATION OF DIFFERENT INTENSITIES. Wm. D. Appel. *Am. Dye. Rptr.*, June 3, 1935, P. 306–11. (C)

MERCERIZATION—ITS PLACE IN RELATION TO OTHER PROCESSES. J. Andrew Clark. *Cotton*, 1935, Aug., P. 43; Sept., P. 58.

A brief history and description of mercerizing, the factors of swelling, luster and untwisting, and discussion of the proper location of mercerizing in the range of processes, in relation to bleaching, dyeing, etc. (C)

PENETRANT: WHEN IS A PENETRANT NOT A—? Harold Schroeder. *Cotton*, July, 1935, P. 50. (C)

POWER AND HEAT FOR TEXTILE DYEING PLANTS. ADVANTAGES OF THE TURBINE. C. H. S. Tupholme. *Am. Dye. Rptr.*, 1935, July 15, P. 391; Oct. 21, P. 591. (C)

PRE-SOAKING OF SILK FLAT CRÊPES AND OTHER AIDS TO BETTER BOIL-OFF. Philip LeBrun. *Tex. Wld.*, Nov. 1935, P. 97. (C)

RAYON SIZE 33: Application. *Monatsh. Seide u. Kunstseide*, 1935, V. 40, P. 200.

"Rayon size 33" has a high wetting and penetrating power, dissolves readily in water, and gives a smooth and pliable sized yarn which runs well on the loom. It does not contain oxidizing constituents and can be stored for long periods. Sizing is carried out at 40–70° C. For the sizing of staple fibre-cotton mixtures additions of up to 50% potato starch are recommended. (From *J. T. I.*, Aug. 1935, P. A396.) (C)

RUBBER LATEX AS A TEXTILE-FINISHING AGENT. H. Boxser. *Tex. Mfr.*, 1934, V. 60, P. 379–80; cf. *C. A.*, 1934, V. 28, Col. 7069.

Some new points, with precautions, are presented on the use of rubber latex in finishing, citing its use for adding water resistance and flexibility, but not waterproofing, when mixed with tapioca starch and a protective colloid such as bone glue, casein or gum tragacanth. (From *C. A.*, 1935, V. 29, Col. 4591.) (W)

SALT BRINE: APPLICATION OF—TO TEXTILE PROCESSES. R. V. Irwin. *Am. Dye. Rptr.*, July 15, 1935, P. 402. (C)

SOURING OF DESIZING LIQUORS. G. Rordorf. *Tex. Mfr.*, 1935, V. 61, P. 161, 167; *C. A.*, 1935, V. 29, Col. 5662; *Tex. Col.*, June, 1935, P. 418.

Providing no acid has been inadvertently added, the concn. of H ions in the desizing bath is held permanently at pH 6.6–6.8 if Viveral S is used.

It is no longer necessary that desizing agents be replenished because of weakening by self-acidification. (W)

SIZING OF RAYONS. H. Gensel. *Monatsh. Seide Kunstseide,* 1935, V. 40, P. 196–8.

Industrial sizing is described fully and numerous formulas are given of sizes for viscose rayon, cuprammonium rayon, and acetate rayon yarns and for mixed-yarn warps and wollstra warps. (From *C. A.*, 1935, V. 29, Col. 5279.) (W)

SOLVENTS IN TEXTILE PROCESSING. A. E. Sunderland. *Tex. Col.,* 1935, V. 57, P. 17–19.

The use of solvents, such as pine oil, cresylic acid, the chlorinated hydrocarbons and the high-boiling naphthas in textile processing, particularly in the scouring of wool, is discussed. The b. p., soly. and fire hazard are given for the more generally available solvents. (From *C. A.*, 1935, V. 29, Col. 5278.) (W)

SOLVENTS UTILIZED IN THE TEXTILE INDUSTRY. J. P. Sisley. *Rev. gen. mat. color.*, 1935, V. 39, P. 142–5, 189–94; *C. A.*, 1935, V. 29, Col. 4591, 5278.

Description and classification of the uses of the various glycols and their derivs. Ethanolamines, ethers and different solvents such as pyridines and perfumes are also discussed. (W)

SULPHONATED AND SULPHATED OILS. Ralph Hart. *Am. Silk & Rayon J.*, 1935, P. 35; *Rayon & Mell. Tex. Mo.*, Dec. 1935, P. 75.

This is the concluding installment of the author's study on the determination of active ingredients and total fatty matter in sulphonated and sulphated oils. A new method is proposed, called the total active ingredients method, which is considered to give the most accurate values. It consists essentially in separating and weighing the pure, undecomposed sulphonated oil. The weight of the fatty matter by this method corresponds to the true fatty matter in the original sample. The new method is also applicable to the true sulphonated fatty and mineral oils, in which cases the other methods are useless as these oils are not decomposed by acid. (C)

SYNTHETIC ORGANIC CHEMICALS: TEXTILES AND THE NEWER. B. A. Harold. *Am. Dye. Rptr.*, Sept. 23, 1935, P. 543. (C)

WOOL: YELLOWING OF. V. Rivetti. *Bollet. della Laniera,* 1935, V. 49, P. 351–63.

Reasons are discussed for the following—natural yellowness of wool and yellowing during growth; yellowing due to the action of nitric acid, nitrous acid, strong alkali, heat and ultra-violet light; yellowing produced by chlorinating, decatizing, sulphuric acid carbonizing and dyeing. (From *J. T. I.*, Dec. 1935, P. A636.) (C)

WOOLEN FABRIC: CHEMICAL ASSISTANTS FOR THE FINISHING OF. R. Brauckmeyer. *Spinner u. Weber*, 1934, V. 52, No. 9, P. 10–12, 15–16; No. 10, P. 7–11.

A review dealing with the action of the chem. assistants on the basis of their chem. compn. and their phys. properties. (From *C. A.*, 1935, V. 29, Col. 8344.) (W)

IV. RESEARCH METHODS AND APPARATUS

ADSORPTION: THEORY. A. Ganguli. *Kolloid Z.*, 1935, V. 71, P. 275–9.

Three kinds of adsorption can be recognized: (1) physical or van der Wall's adsorption; (2) chemical or activated adsorption; (3) slow adsorption attributable to diffusion through fissures and intermicellar spaces or through the crystal lattice. The various theories of adsorption are critically discussed, adsorption formulae, introducing oscillation, are derived, and the temperature effect is explained. (From *J. T. I.*, Oct. 1935, P. A537.) (C)

ADULTERATION: METHODS OF ANALYSIS OF (OLIVE) OILS WITH A VIEW TO DETECTION OF. G. Tommasi. *Ann. staz. chim. agrar. sper. Roma*, (through *C. A.*, 1935, V. 29, Col. 4195); *J. T. I.*, Sept. 1935, P. A467. (C)

CLOTH: WATER- AND RAIN-PROOF TESTS. J. Ph. Peper and A. ten Bruggencate. *Med. Rijksvezeldienst*, 1935, No. 43, P. 10 (reprinted from *Polytech. Weekblad.*, 1935, V. 29, No. 5, P. 71).

The methods of testing (funnel, spray, etc.) proposed by Veitch and Jarrell (*J. Ind. Eng. Chem.*, 1920, V. 12, P. 26) are described and the author's experience of the tests is discussed. The essential difference between the funnel and spray tests is emphasized. (From *J. T. I.*, July, 1935, P. A362.) (C)

FATIGUE CRACKING TEST FOR TIRE TREAD COMPOUNDS. E. T. Rainier and R. H. Gerke, U. S. Rubber Products, Inc. *Ind. & Eng. Chem., Anal Ed.*, Nov. 15, 1935, P. 368. (X)

CONDITIONING BALANCE: NEW. F. Sartorius. *Deut. Wollen-Gewerbe*, 1934, V. 66, P. 1017–18.

The new conditioning balance L. W. K. which is described in detail and shown in two illustrations is a precision instrument with a sensitivity of 0.01 g. for a max. load up to 2 kg., and is said to allow quick, accurate weighing. It is designed for use in wool combing, washing, and spinning mills and conditioning plants. (From *C. A.*, 1935, V. 29, Col. 8345.) (W)

COTTON HAIR STRENGTH TESTER: MODIFIED O'NEILL. N. Ahmad. *Indian Tex. J.*, 1935, V. 45, P. 371.

Important features of this tester are the introduction of a U-shaped tube with floats for the liquid, of an electric contact device ensuring auto-

matic needle stoppage when the hair breaks, and of a dial and needle to record the results. (From *J. T. I.*, Dec. 1935, P. A636.) (C)

Cross-section Slicer Aids Study of Wool, Hair, Fibres: Simplified. J. I. Hardy. *Rayon & Mell. Tex. Mo.*, Oct. 1935, P. 55. (C)

"Dry" Mercerizing Liquors: Routine Testing of. F. T. Heyes. *Tex. Rec.*, June 15, 1935, P. 62. (C)

Elasticity: Testing of. E. Lipowsky. *Spinner u. Weber*, 1934, V. 52, No. 42, P. 1–3.

The elongation values of two cotton fibres are given which were obtained by the use of a Krais tear app. As the values between the two samples differ greatly, although they originated from the same bale, it is evident that the elongation property of fibres may vary to a large extent because of variations in growth and structure. Tests on yarns give similar results. Yarns showed a more uniform elongation line in a graphic representation (elongation vs. load) than did the fibres, while threads yielded the most uniform elongation line. The ratio of the surface enclosed by the load-elongation lines of the elastic elongation to the surface enclosed by the load-elongation line of the total elongation indicates the degree of elasticity. (From *C. A.*, 1935, V. 29, Col. 8346.) (W)

Fabrics: Tensile and Bursting Strengths. S. Kjellstrand. *Textilber.*, 1935, V. 16, P. 402–5, 476–7; *Rayon & Mell. Tex. Mo.*, Oct. 1935, P. 79.

A theoretical equation for the determination of the sum of the tensile strengths in warp and weft directions from the bursting pressure and the height of the arch formed by the fabric in the Schopper-Dalen bursting pressure apparatus is deduced, and the conditions under which it is applicable are indicated. The agreement between the calculated values and those determined by actual tensile strength tests is shown to be good in the case of fabrics having the same material in the warp and weft. The differences shown by fabrics in which the warp and weft differ in extensibility, particularly union fabrics, and in fabrics which have been stretched or distorted in finishing processes, are discussed. (From *J. T. I.*, Oct. 1935, P. A525.) (C)

Measurement of the Electrical Resistance of Yarns and Cloths. Variation in the Resistance of Silk with pH. W. S. Denham, E. A. Hutton, and T. Lonsdale. *Trans. Fara. Soc.*, Vol. XXXI, No. 166, March, 1935, P. 511–519.

This paper describes a new method of measuring the insulation resistance of yarns and fabrics and gives the precautions, chiefly those of humidity control, that have to be observed in order to obtain reliable results with materials of this character. These methods of measurement are then used to reveal variations in the electrical resistance of silk with electrolyte content, which are related to its behaviour as an amphoteric protein. (S)

Measurement of Electrolyte Content of Textiles. I, II. A. A. New. *Tex. Mfr.*, 1935, Nov., P. 466; Dec., P. 508. (C)

OXYCELLULOSE: PRESENT STATE OF DETERMINATION OF. P. Heermann. *Rayon & Mell. Tex. Mo.*, 1935, Sept., P. 101; Oct., P. 71. (C)

pH CONTROL: VALUE OF. Fredk. R. Harrison. *Tex. Wld.*, Sept. 1935, P. 117.

The author illustrates the value of pH control by a practical and embarrassing result of failure to employ it in his wet finishing. He describes a portable comparator of the colorimetric capillary type and its use. He also gives a list of indicators commonly used in making pH measurements. (C)

PAPER: DETERMINING THE RIGIDITY, STIFFNESS AND SOFTNESS OF. James d'A. Clark. *Paper Trade J.*, Mar. 28, 1935, P. 41–44; Nov. 21, 1935, P. 46. (C)

PHYSICAL TESTING OF TEXTILES: BIBLIOGRAPHY ON THE. (1909 to 1934) Ellery H. Harvey. *Am. Dye Rptr.*, Dec. 16, 1935, P. 703. (C)

TENSION OF COTTON YARNS DURING WINDING. Dr. Walter Reiners. *Tex. Mfr.*, July, 1935, P. 275; *Tex. Rec.*, June 15, 1935, P. 51.

Describes an apparatus with the help of which measurements of the fluctuations of yarn tension on any type of winding machine can be made, practically without lag. (C)

TESTING YARN BY PROJECTION. T. Lonsdale. *Tex. Mfr.*, Aug. 1935, P. 314.

Describes the way in which an ordinary camera has been used to project an enlarged image of a length of yarn upon a screen, where it was examined without the eyestrain involved in using a low-power microscope. (C)

V. ECONOMICS, PHYSICS AND MISCELLANY

COLOR VISION: FOUR-COLOR THEORY OF. J. F. Schouten. *K. Akad., Amsterdam, Proc.*, 1935, P. 590–603; *Science Abs.*, Sept. 1935, Col. 3905. (X)

CORN AMYLOSE: RETROGRADATION. T. C. Taylor and S. G. Morris. *J. Am. Chem. Soc.*, 1935, V. 57, P. 1070–72.

The retrogradation of corn amylose is discussed. α-Amylose and retrograded β-amylose can be differentiated by acidification of their alkali dispersions, when α-amylose is reprecipitated. (From *J. T. I.*, Sept. 1935, P. A474.) (C)

DYE ABSORPTION: DETERMINATION OF THE FINENESS OF NITRO-CELLULOSE BY. A. J. Phillips. *Ind. & Eng. Chem. Anal. Ed.*, Nov. 1935, P. 416. (X)

META STRUCTURES OF MATTER. W. Ostwald. *Kolloid Beihefte*, Aug. 1, 1935, P. 109–24.

A survey of colloidal chemistry, with the separate identity of noncrystalline matter as its main thesis, considered in 5 parts, as follows:

Part I consists mainly of a dimensional study of micro- and macro-structures, and ranges in treatment from electrons to atoms, molecules, and fixed stars. Emphasis is laid on the existence of intermediate or meta-structures having dimensions between those of light waves and molecules. Part II contains a lengthy discussion of the film, thread, and disperse states of matter, and of boundary systems between them. An instructive table of such systems and a diagram of structures are included. Part III briefly touches on swarm structures. Part IV discusses the thesis that meta-structures are not merely simple summations or averages of microscopic and molecular structures, but have separate identities with their own special characteristics. Part V deals with the latter. (From *Science Abs.*, Oct. 1935, Col. 4053.) (X)

PRINCIPLE OF VIRTUAL WORK APPLIED TO THE DETERMINATION OF CRITICAL LOADS. O. Zanaboni. *Ricerche di Ingegneria*, May–June, 1935, P. 80–91.

It is shown how a structure in a state of indeterminate equilibrium (under the action of critical loads) leads to an equation of virtual values of the second order, in every way analogous to the ordinary equation of virtual work. From this equation can be deduced approximate methods (with an unlimited degree of approximation) for the practical determination of the critical loads, and it is shown that the methods already used for this purpose appear as particular cases of the present method. Several examples are treated in detail. (From *Science Abs.*, Oct. 1935, Col. 4095.) (X)

VISCO-ELASTIC PROPERTIES OF PITCH-LIKE MATERIALS. K. Iida. *Tokyo Univ. Earthquake Research Inst. Bull.*, June 1935, P. 433–55.

In English. In a previous paper the behaviour of these materials under ordinary steady tests was described. The effect of repeated torsional stresses is now described. The stress-strain curve is an ellipse, the shape of which varies according to the period of these repeated twists. The longer the period, the more the major axis of the ellipse tends to become vertical. The moduli of these substances decrease with increase in the period of the repeated twists, while their viscosity increases. The elastic after-effect and the hysteresis are marked. If the material of the earth's crust be assumed to have properties of this sort, coastal deformations and the propagation of earthquake-waves may be easily explained. (From *Science Abs.*, Oct. 1935, Col. 4163.) (X)

VISCOUS FLUID: MOTION OF—UNDER A SURFACE LOAD. N. A. Haskell. *Physics*, Aug. 1935, P. 265–9.

A formal solution is given for the motion of a highly viscous fluid when a symmetrical pressure is applied at the surface. This is applied to the subsidence of a cylindrical body of constant thickness and to the recovery of the fluid after removal of a load. Applying the latter case to the plastic recoil of the earth after the disappearance of the Pleistocene ice sheets, it is found that the geological data imply a kinematic viscosity of the order of $3 \times 10^{3} - 1$ C.G.S. units. (From *Science Abs.*, Oct. 1935, Col. 4164.) (X)

WOOD: FINE STRUCTURE OF. H. Saechtling and H. Zocher. *Kolloid Z.*, Sept. 1935, P. 336–45.

The absorption of any one swelling agent, with lowering of the vapour pressure, proceeds similarly for wood and lignin. One type of absorption isotherm is given by benzene, ether and acetone, and another by methanol, water, and possibly, pyridine. Quantitatively, however, the absorptions of the different liquids by wood and by lignin differ considerably. Calculation of the proportions of the total absorptions due to the separate components of the cell-wall of the wood shows that absorption by the lignin is especially great with ether or acetone whereas with methanol and particularly with water the part played by the cellulose predominates. (From *Science Abs.*, Oct. 1935, Col. 4062.) (X)

VELOCITY OF FALL OF SOLID SPHERES THROUGH A VISCOUS FLUID. M. Ghali. *Compt. Rend.*, June 24, 1935, P. 2155–7; *Science Abs.*, Sept. 1935, Col. 3300. (X)

VISCOSITY: INFLUENCE OF ELECTRIC FIELD ON—OF AEOLOTROPIC LIQUIDS. Y. Bjornstahl. *Physics*, Aug. 1935, P. 257–64; *Science Abs.*, Oct. 1935, Col. 4128. (X)

VISCOSITY COEFFICIENT OF LIQUIDS: INFLUENCE OF MAGNETIC FIELD ON THE. P. K. Raha and S. D. Chatterjee. *Indian J. Phys.*, July 1935, P. 445–54; *Science Abs.*, Oct. 1935, Col. 4127. (X)

VISCOSITY OF OILS. R. B. Dow. *Physics*, Aug. 1935, P. 270–2; *Science Abs.*, Oct. 1935, Col. 4129. (X)

VISCOSITY FORMULA FOR BINARY MIXTURES. T. Ishikawa. *Chem. Soc. Japan*, Bull. 10, June 1935, P. 248–52; *Science Abs.*, Sept. 1935, Col. 3784. (X)

VISCOSITY AND HEAT CONDUCTION ACCORDING TO THE GEOMETRICAL WEIGHT METHOD. W. S. Kimball. *Phil. Mag.*, Aug. 1935, P. 355–90; *Science Abs.*, Sept. 1935, Col. 3929. (X)

Book Reviews

RAYON AND SYNTHETIC YARN HANDBOOK. Second Edition. Dr. E. W. K. Schwarz and H. R. Mauersberger. Rayon Publishing Corp., 303 Fifth Ave., New York, N. Y. pp. 558, Price $3.75.

This is a second and enlarged edition of this practical reference book. Among the new subjects treated and their authors are the following: Dry Cleaning of Rayon and Acetate Materials, C. C. Hubbard; Laundering of Washable Synthetic Fabrics, George H. Johnson; Testing—Physical Tests and Chemical Tests and Identification, Dr. Irving J. Saxl. The chapter on the Economic and Statistical Background has been completely rewritten and brought up-to-date by Stanley B. Hunt. In a chapter descriptive of the four yarn manufacturing processes the viscose process is described by H. B. Vollrath, the cellulose acetate process by Dr. H. DeW. Smith, and the cuprammonium process by Theodore Wood. The regular features of the first edition have been brought up-to-date, and there is a very complete subject index. (C)

Men, Money and Molecules. Williams Haynes. Doubleday, Doran & Co., Inc., Garden City, N. Y. 214 pp.

Possibly this book would be most accurately defined as an outline historical sketch of the chemical industry from its beginnings to the present time. But the author presents in these pages a sketch, or biography, of a great benefactor of mankind; not that of an industry lacking individuality and soul. It is as interesting and informative reading as the best of the modern analytical biographies. The book is dedicated to Hon. Francis P. Garvan, president of the Chemical Foundation and of U. S. Institute for Textile Research, Inc. (C)

Textile Foundation's Educational Program

THE Textile Foundation announces that work has been started in carrying out the recommendations of the committees of deans of the textile schools for the preparation of teaching materials. These recommendations include (1) the assembling, co-ordination and revision of teaching materials in the field of textile technology; and (2) the preparation of materials for teaching a group of subjects in the field of textile economics.

The preparation of teaching materials in the field of textile technology has already made considerable progress. The preparation of materials for four major courses on textile economics has been assigned by the Foundation to Dr. Alfred H. Williams, professor of industry at the Wharton School of Finance and Industry, Philadelphia, Pa. Dr. Williams has already visited most of the textile schools in this connection, and has the aid of five of his associates in this work. It is expected that materials for at least two of the following major subjects will be ready for use next fall: Textile Accounting, Textile Economics, Textile Marketing, Textile Management.

These proposals to prepare and distribute teaching materials should not be confused with the idea of preparing standardized courses. The Foundation and the heads of the schools recognize that the successful training of young men rests quite as much on the individuality and ability of the teachers in the several institutions as on the teaching materials. The teaching materials in both the technical and economic subjects are being developed in co-operation with the industry and the schools, and in loose-leaf form so that they may be adapted to the needs of the different schools, and used by them either as full texts or as texts supplementary to materials already available.

In sponsoring this educational program, the heads of the textile schools and the Foundation are, in co-operation, carrying out certain of the recommendations made in the earlier report prepared by the Textile Foundation, entitled "The Training of Men for the Textile Industry." The program is in charge of the deans of the textile schools, who constitute the General Committee, of which Frederick M. Feiker, who prepared the report, is chairman.